THE IMPACT OF INTERNAL FINANCE AND FINANCIAL CONSTRAINTS ON INVESTMENT: EMPIRICAL EVIDENCE FROM MANUFACTRING SECTOR OF PAKISTAN

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Abstract

Many studies estimates investment-cash flow sensitivities (ICFS) and the financial constraints impact on investment. However, a controversy exists in the literature to substantiate ICFS as a representative of financial constraints. This thesis re-examine the controversy by investigating panel data of 288 listed Pakistani firms predefined as constrained and unconstrained over a period of 2002 to 2012. Higher ICFS signify superior financial constraints. For robust estimations, five different criterions for pre classification have been adopted. Using First Difference Generalized Method of Moments (GMM) technique for estimation results reveals strong and positively significant investment-cash flow sensitivities for full as well as sub samples. Additionally, results demonstrate that investment – cash flow sensitivity of constrained group is significantly higher relative to unconstrained firms. Thus proper investment and development policy should be instigated to reduce capital market imperfections and to promote private corporate investment in Pakistan.

Keywords: Investment-cash flow sensitivities, financial constraints, internal finance, external finance, investment

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Chapter I

Introduction

The most current and acute financial collapse confirms that financial markets are not certainly efficient and perfect. The curbs and restrains that define the markets can impede the corporate investments in lucrative projects (Campello, Graham, & Harvey, 2010a, 2010b). Indeed deep-rooted economic consequences can emanate due to recent catastrophe and organizations may like short term cash flows in exchange for sprawling long haul value. Antithetically, Modigliani & Miller (1958) proposed that firm financing sources are irrelevant to firm's decisions for investments. There is no difference between the costs of obtaining internal and external financing and they are totally equivalent in a perfect financial system. However, their theoretical approach has been based on drastic simplifications, partial equilibrium analysis and of static nature. The cost of external finance surpasses the cost of internal finance with introduction of capital market imperfections like information asymmetry, agency costs and the tax system or capital market accessibility.

The debate was intensified by the seminal work of Fazzari, Hubbard & Peterson (1988) on the internal finance and investment sensitivities. Under the assumption that internal finance is less costly than external finance and using cash flows as a proxy for internal finance, they showed that in constrained firms internal finance play an important role in deciding the marginal capital spending. They observed that bigger the wedge between internal and external financing the greater the investment cash flow sensitivities are. This hypothesis is supported by a number of studies like Carpenter, Fazzari & Petersen (1994), Bond, Harhof, & Van Reenen (1999) and Nickell & Nicolitsas (1999).

This seminal study was extensively challenged by Kaplan & Zingles (1997). They used the same data as Fazzari et al. (1988), complemented with corporate annual reports. They questioned the positive relationship between investment and cash flows i.e. validity of the financial constraints measure used by Fazzari et al. (1988). In opposition, Kaplan & Zingales (1997) concludes with highest investment-cash flows sensitivities for least constrained firms. This line of research is also supported by a number of studies reminiscent of Cleary (1999), Erickson & Whited (2000) and Chang, Tan, Wong & Zhang (2007).

Thus, much attention has been devoted on the role of internal finance in corporate investment decisions. Still there is no consensus on positive or negative influence of relationship between the variables. Cleary, Povel, & Raith (2007) by coalescing both schools of thought argued that the relationship is positive everywhere and this contradiction can be result of lack of appropriate empirical proxy for financial constraints. They proposed a U-Shaped relationship due to investments revenue and cost effects interactions. Other studies that studied non-monotonic relationship are Guariglia (2008), Hovakimian (2009), Hadlock & Pierce (2010) and Firth, Malatesta, Xin, & Xu (2012). This thesis re-examine the controversy by investigating first time the panel data of 288 listed firms from Pakistan.

1.1 Study Rationale

First, owing to the topical economic crisis considerable part of the businesses could turn out to be economically restrained. This can direct companies' risk-taking behavior to an altered trail and coerce towards a more liquid balance sheet (Almeida, Campello, & Weisbach, 2011). Bates, Kahle, & Stulz (2009) argued that in determining the capital structure decisions the importance of cash should be taken into account. Khramov (2012) showed that investment to cash flow sensitivities doubled due to increased financial constraints due to the financial crisis.

Also Dunchin, Ozbas & Sensoy (2010) and Campello et al. (2010a, 2010b) proved that in general firms were extra financially constrained during the financial crisis. Since the repercussions of crisis are still there in world financial system. In this wise, it is apropos to study the necromantic link relating internal finance, financial constraints and fixed investment.

Second, Substantial amount of researchers studied panels of large listed companies from developed countries. However, the financial markets are well developed in those countries and it is less likely that enterprises from developed markets suffer severe financial constraints in contrast to organizations from emerging markets like Pakistan. Therefore, it is fundamental to study the enigmatic relationship in emerging market like Pakistan.

Lastly, an increasing attention is devoted in analyzing role of financial constraints and the influence of internal finance in the investment behavior of firms (Fazzari et al., 1988; Kaplan & Zingales, 1997; Guariglia, 2008 and Francis, Hasan, Song, & Waisman, 2012). However, there is lack of consensus on the positive or negative relationship of internal finance and investment. Thus, this thesis will enhance insights into the ambivalent relationship among internal finance, financial constraints and fixed investment. Moreover, to the best of my knowledge this will be first study of its own kind focusing Pakistani corporate environment.

1.2 Objectives & relevance

This thesis plans to explore the idea of financial constraints and its impact on the relationship of internal finance measured with cash flows and fixed investments. Much consideration is dedicated to this cryptic impact. Nonetheless, researchers are uncertain about impact of financial obstacles on the relationship. Citing Bassetto & Kalatzis (2011, p. 264), “the literature on financial constraint in investment decisions have not yet arrived at a definitive

conclusion about when a firm is financially constraint." This study endeavors to reveal further insight into this open deliberation. The target of this examination is to research, the consequences of financial constraints on the relationship between internal finance and firm investment behavior. Moreover, it will question the ICFS representation of financial constraints.

1.3 Research question

This research explores the following research question:

"Do financial constraints indoctrinate the consanguinity between investment and internal finance in Pakistani non-financial sector firms?"

1.4 Thesis structure

In chapter 2, a literature review on the topic is presented. First, investment-cash flow sensitivities as a background to the empirical study is argued. Second, literature on investment, internal finance and financial constraints are discussed and in the last, hypotheses tested are presented.

Chapter 3 is devoted to description of research methodology. First, research sample is described. Second research method and estimation technique is illustrated. Third variables used in the study are defined. Last the empirical research model used for studying effects of financial constraints on firms' fixed investment and internal finance in Pakistan using Q model specification is described.

In Chapter 4 results of the study are discussed. First Descriptive statistics related to hypothesis are presented then correlation analysis of the variables. Lastly, the results from the regression models are discussed for full sample and for sub samples.

Finally, chapter 5 concludes the paper with a review of empirical findings and discussion of relevant policy implications. Last, some suggestions of how research can be extended in the future are recommended.

Chapter II

Literature Review

An extensive approach has been applied, in order to precisely comprehend the impact of financial limitations on the nexus between internal financing and investment. Accordingly, a detailed review of literature is presented in this chapter to support the research.

2.1 Market imperfections and the sensitivities

For real investments the structure and financial policy of firms is considered extraneous in certain expectations. There is no difference in the values of levered firm and unlevered firm (Modigliani & Miller, 1958). Resultantly firm's value is neutral to the capital structure in a perfect capital market. Rather, the performance of firm's investment creates future cash flows with a positive net present value and the present value of these future cash flows is considered as the determining factor of firm's value. Similarly, the anticipated future profits should energies the investments of a firm instead of the availability of internal funds. Further, the net present value of, cash held in perfect market is regarded as inconsequential and an investment with zero net present value. One reason is that there are no financing frictions, e.g. information asymmetry, agency costs, accessibility of the capital market or the tax system in the perfect capital markets. These markets are grounded on severe generalization.

Denis (2011) gave the view that the existence of financing frictions makes corporate finance very motivating. External capital is not costless substitute for internal capital, unless the supposition of the perfect capital market holds true. The decline in firm's value and growth is thus the consequence of low investment than the first-best optimum by firms with growth prospects. Denis & Sibilkov (2010) further argued that with aim of extenuating these adversative

effects, firms with high costs of external finance i.e. financially constrained firms depend more on internal capital. Consequently, such obstacles in financing can have an impact on firm's capacity to embark on investments with a positive net present value (Almeida et al., 2011; Campello et al., 2010a). Further, the theories discussed below depict the detailed phenomenon.

2.1.1 Agency Dilemma

Hillier et al., (2010) elucidated agency relationship as the relationship that exists between the shareholders and management of organizations, where the later works in the interest of former to effectually regulate the organization. However, the classical agency theory provides further guidelines. According to Fama (1980), besides the agents (managers) who manage the firm, there is another person who undertakes the risk financially and resolutely maneuvers the firm to escalate the profits is termed as Principal. Nevertheless, Jensen (1986) argued that when the principals (the owners of the firm) are not managers (who regulates the firm), managerial agency complications occur. The assessment of the performance and behavior of managers, who are also owners to that of those who are not owners, revealed that investments of firms are affected by the struggle and determination of the managers (Jensen & Meckling, 1976).

In order to accumulate thorough pool of resources under their disposal, managers would aim at enhancing growth beyond the best extent. Murphy (1985) also supported the argument that managers are motivated to increase the resources under their control, due to a positive nexus between their compensation and progression in sales. According to Kadapakkam, Kumar, & Riddick (1998), this creates doubts in the minds of external investors that managers instead of giving consideration to the interests of shareholders invest and undertake projects for their own interests and benefits. Jensen (1986) & Stulz (1990) asserted that this increased risk for external investors results in extra premium on external finance's costs and also the enlarged cost of

investment monitoring leads to estimated higher return for these costs' compensation. Stulz (1990) modeled the free cash flow theory presented by Jensen (1986). Free cash flow theory replaced the managerial agency theory. Free cash flow is defined as *'Cash flow in excess of that is required to fund all projects that have positive net present values when discounted at the relevant cost of capital'*(Jensen, 1986, p. 323). Firms' equity holders restricted the managers' access to free cash flow, with an aim of extenuating the managerial agency problem. Though Jensen (1986) & Stulz (1990), argued that a compromise to this restriction is the ample obtain ability of internal capital for managers so that all the projects with positive net present values can be funded efficiently and inaccessibility of excess internal funds to profligately spend on loss making projects.

2.1.2 Asymmetric information

Cost of capital for internal and external finances are alike in the presence of perfect capital market, still, difference in costs can arise due to asymmetric information, due to which these are not impeccable alternatives. Kadapakkam et al. (1998) argued that asymmetric information relies on the readiness of thorough information about investments decisions for insiders in comparison to outsiders, which depicts the phenomenon that market contributors do not enjoy the privilege of same access to information. Further, Myers & Majluf (1984) indicated that the above mentioned information and contracting problems result in extra premium on external capital which consequently stimulates external investors to understate the risky securities. In competitive markets credit rationing categorized the information asymmetry (Greenwald, Stiglitz & Weiss, 1984). Myers (1984), Brennan & Subrahmanyam (1996) and Easley & O'Hara (2004) supported a positive relationship between cost of external finance and information asymmetry. These conditions will make capital availability the determining factor

for firm's investment instead of its capital cost. Ascioglu, Shantaram & McDermott's (2008) predominantly concluded that the higher investment-cash flow sensitivity depends on high information asymmetry. Schiantarelli (1995) discussed that the impact of information asymmetry is likely to be high on smaller firms. He further said that smaller firms are more probable to witness short track records, lower collateral values, and distinctive risk in contrast to their greater bankruptcy costs and liabilities.

Hyytinen & Väänänen (2006) debated the two different problems regarding the theory of information asymmetry i.e. moral hazard and adverse selection. If an external financier is unable to discriminate between the diverse firms in need for a loan (as outsiders are quite unable to compare between the loans to a good or bad firm), the problem is related to adverse selection. As this problem arise in preliminary stage of financing, mitigation against these is indispensable. Stiglitz & Weiss (1981) highlighted that greater rate for compensation is offered by outsiders, with motive of reducing the potential losses from a loan to bad firm.

When firm uses the funds of loan (provided by outsiders) contrarily to the purpose mentioned earlier, the problem of moral hazard arises. Bester & Hellwig (1987) illustrated moral hazard as firms' intent to use the loan money for alternative motives and undertake superfluous risks from perspective of the external financier. However, the problems of adverse selection are more predominant than that of moral hazard (Hyytinen &Väänänen, 2006).

Conclusively, both managerial agency and information asymmetry theories arrive at the same decision that the external costs entail premium in contrast to the internal costs. This results in more dependence on internal finance when firms face constraints in acquiring external finance. Kadapakkam et al., (1998) emphasized that big firms due to their higher elasticity in

investment timings face more managerial agency problems. Further, as large companies listed at stock exchange are bound to provide additional information than small unlisted companies, the former is anticipated to face lower problems related to information asymmetry (Bernanke, Gertler & Gilchrist, 1996 and Carreira & Silva, 2010).

2.2 Deciphering Triumvirate

In this section investment, internal finance and financial constraints are defined and discussed.

2.2.1 Investment

Investment is defined as: *"the increment of capital equipment, whether it consists of fixed capital, working capital or liquid capital. Moreover, significant differences of definition are due to the exclusion from investment of one or more of these categories*" (Keynes, 2006, p. 69)

Modigliani & Miller (1958) argued that a firm's capital cost does not depend on its capital financial structure and consequently firms' market value is free of its capital structure. The achievement of investments with an affirmative net present value creates future cash flows for a firm, and present value of these future cash flows determines the firm's value. Studies depict that the firm's investment should not be influenced by accessibility of external or internal financing, rather the predicted forthcoming profitability should be the only focused factor. Therefore, the value of firm cannot be stimulated by the capital financial structure in a perfect capital market. Financing frictions are comprised of information asymmetry, tax system, agency costs or capital market approachability. Moreover, financing frictions does not overwhelm such perfect capital markets, as these markets are founded on extreme generalizations. According to these suppositions, for real investments, the structure and policy of financing are unrelated.

In perfect capital markets, the financing and investment choices of firms are independent. Moreover, in order to adhere to unanticipated requirements, the financial structure can be attuned as firms enjoy thorough financial elasticity. Ağca & Mozumdar (2008) stated that financing decisions have nothing to do with investment decisions and the investment opportunities is regarded as the only influential element of investments in an organization. Contrarily, Denis (2011) in his work "Financial flexibility and Corporate liquidity" argued that the existence of financing frictions bring imperfection in capital markets and makes corporate finance motivating. Almeida et al. (2011), Khramov (2012) and D'Espallier & Guariglia (2012) too accede to the impact of financing decisions on making investment decisions. Kaplan & Zingales (1997) and Fazzari et al. (2000) presented that for firm's profit maximization, investments are reliant on the readiness of internal finance.

According to Fazzari et al. (1988), Degryse & De Jong (2006), Guariglia (2008), D'Espallier & Guariglia (2012) and Firth et al. (2012), the change in tangible fixed assets (taking depreciation into account) during a year determines the level of investment in an organization.

2.2.2 Internal finance

Generally, business itself generates this money, as defined: "Internal finance simply refers to what the firm earns and subsequently plows back into the business, such as retained earnings or depreciation", (Jordan, Westerfield & Ross, 2011, p. 105). According to Megginson, Smart & Gitman (2006) internal finance accounts for almost two thirds to three quarters of businesses' capital spending in the United States. Similarly, in Europe internal financing is foremost financing source. Further, an increasing trend has been observed in Japan towards

internal financing. As for as Pakistan is concerned, against regional 67% in South Asia approximately 89% of investments are financed internally by enterprises[1].

Cash holdings can be the outcome of internal finance, but these are not inappropriate in perfect capital market. Assume company's cash flows are not enough to cover its upcoming expenses, resultantly fund raising becomes the need for company, which it can fix at nil rates. Opler, Pinkowitz, Stulz & Williamson (1999), argued that the characteristic of static environments not only leads to no liquidity premium but also to zero difference between costs of internal and external financing. External financing is a funding or financing acquired from exterior sources, like obtaining loan or stock selling. Recent empirical studies emphasized on exploring the literature of cash holdings. Keynes (1936) reasoned about the precautionary and transactions cost motive of cash holdings, which are considered as two positive points of the later and presented a theory about this mechanism. Keynes' theory is a pivotal area of research for number of researchers as it is regarded as main factors of corporate cash holdings (Kim, Mauer, & Sherman, 1998; Pinkowitz & Williamson, 2001 and Ozkan & Ozkan, 2004). Opler, Pinkowitz, Stulz, & Williamson (1999) explained that cost incurred in changing cash alternatives into cash forms the basis of transaction costs motive. Funds can be acquired through new debt or equity and selling assets by companies with scarce internal finance. Ozkan & Ozkan (2004), delineate that all the aforesaid decisions include costs and expectedly companies possess grander volume of liquid assets as they sustain higher transaction costs. Miller & Ohrr (1966) and Myers & Majluf (1984) also asserted on this phenomenon.

The cost which arises as a resultant of investment prospects' implementation leads to the importance of precautionary motive. The basis of this motive is the theory which states that

[1] http://www.enterprisesurveys.org/Data/ExploreEconomies/2007/pakistan#finance

excessively high cost of external financing or deficit in cash flow results in cash accumulation by companies through internal financing. Therefore, companies incessantly forecast the investment choices due to impetus of holding liquid assets. Conventionally cash flow is the measuring factor for internal finance and pragmatically this variable is being utilized by every researcher. Fazzari et al., (1988), Kaplan & Zingales (1997), Guariglia (2008) and Ağca & Mozumdar (2008) also used this variable in research studies and described that net income before unusual items plus depreciation is the mainly used cash flow measure. Cleary et al. (2007) and Firth et al. (2012) used a different measure such as operating cash flow. George, Kabir, & Qian (2011) preferred depreciation and amortization, earnings before interests and taxes as a proxy to measure internal finance. Chen & Chen (2012) used net income before extraordinary items plus depreciation and amortization and Silva & Carreira (2010) used net income before taxes plus depreciation. Further, cash flow produced from internal sources is pivotal in funding incremental fixed assets (Guariglia et al. 2011).

2.2.3 Financial constraints

Financial constraint is a theoretical idea which is quite difficult to discretely define. Different authors defined financial constrained antagonistically and no consistency is found on the definition. A succinct definition is, "*financial constrained firms face a wedge between the internal and external costs of funds"* (Kaplan & Zingales, 1997, p. 172). Theories of managerial agency and asymmetric information identify the detailed reasons behind this wedge. However, there is a limitation to the aforementioned definition that external financing always come with a transaction cost and it depicts that pragmatically every firm is financially constrained. However, researchers have tried to avert such oversimplification. Another definition depicts that *"the inability of a firm or a group of firms to raise the necessary amounts (usually due to external*

finance shortage) to finance their optimal path of growth" (Carreira & Silva, 2010, p. 732). Guariglia (2008) presented a moderately abstract definition of financial constraints. According to him firms whose activities are inhibited by the volume of internally created funds are termed as internally financially constrained. The theory of financial constraints entails that the quantification of this variable is quite difficult and efforts have been made to find a method to measure financial constraints (Silva & Carreira, 2010).

Fazzari et al. (1988) is considered as a seminal paper, who first empirically studied financial constraints as investment-cash flow sensitivity. Following Fazari et al (1988) several researchers Kaplan & Zingales (1997), Audretsch & Elston (2002), Bond et al. (2003), Almeida & Campello (2007), Guariglia (2008), Poncet et al. (2010) and Silva & Carreira (2012) also used these sensitivities as an indirect measure of financial constraints. Contrarily, Kaplan & Zingales (1997) used annual reports in addition to same data used by Fazari et al (1988) and proposed an opposite conclusion. Along with Hoshi et al. (1991), Gomes (2001), Cummings et al. (2006), Hovakimian (2009) and Hovakimian & Hovakimian (2009) Kaplan & Zingle suggested that opposite conclusion may be because of investment opportunity bias i.e. cash flows captured investment opportunities that are not captured by the Tobin Q. To avoid such problems, in this research degree of financial constraints is measured through five different empirical proxies.

2.3 Investment with financial constraints

The current research on capital-market reveals that financial factors may be the determining factors for real investment. Gertler's survey (1988) elucidates that internal finance may be less costly than external finance due to transaction cost, agency problems or asymmetric information. This majorly focuses on distinguishing two types of individuals. Those who possess thorough information about investment prospects of firm (insiders) and those who have a

limitation of drawing a line between the quality of individual firms (outsiders), though they may precisely distinguish the prospects for a number of firms. Another argument is lenders may ration credit due to asymmetric information (Stiglitz and Weiss, 1981). This phenomenon can be the result of firms either leaving the applicant pool or undertaking riskier projects due to higher interest rates. Firm managers tends to be more conversant of firm's new investment opportunities and existing assets' values than the new investors, in external equity markets. Myers and Majluf (1984) delineates why firms are forced to sell new shares at discount in such environment, provided they can sell. The investment should be influenced by internal finance's variation i.e. rationing of external funds or their availability only at premium price.

2.3.1 Investment smoothing

Eisner and Strotz (1963) and Lucas (1967) have encouraged investment smoothing as increase in the rate of investment stimulates the marginal adjustments costs of obtaining and installing capital to rise. Also, marginal adjustment costs' estimates from Tobin's q investment equations increase rapidly due to increase in investment and are quite very large (see Summers (1981), for example). Bernstein and Nadiri (1989) and Chirinko and Fazzari (1994) discussed multi-equation structural models of firm behavior from which smaller but economically significant estimates have been attained. In long run, capital accumulation plays a pivotal role for a firm. For any long run path of capital accumulation, by stabilizing investment over time, the firm's long run cost will reduce with increase in marginal adjustment costs.

Myers and Majluf (1984) stressed on the difficulty in "storing" investment projects. This also encourages the need for investment smoothing, as firms' investment projects cannot be stored or deferred without involving cost. New investment opportunities always arise due to firm's own innovation and innovation spillovers, peculiarly in fast growing industries. However,

these opportunities are short-lived and their value vanishes if firm fails to exploit them in time. This is linked with short product life cycles, first mover advantage by commercializing new technologies and other problems. Assume, the projects are perishable and as more of them are undertaken their marginal values will decrease. A firm whose investment spending is governed by cash flow fluctuations will follow different pattern. During below-average cash flow, it would forgo high marginal value projects in order to undertake comparatively low marginal value projects during high cash flow. However, if there is method to level the investment in relation to cash flow variation, the afore-mentioned investment behavior is evidently effective. Although, investment projects are quite distinct and require time to complete, yet calculated investment spending can take place incessantly. Fleeting shortfalls in cash flow may add cost to a firm in decisions to contract or remove spending on a project that is in progress.

2.3.2 The role of working capital

Since Adam Smith differentiate fixed and circulating capital (in The Wealth of Nations (1776), working capital has been identified by economists as a significant factor for firm's stock of capital. Also, in modern firms, fixed capital and working capital enjoys the same level of importance. For instance, Income statistics' depicts that in manufacturing concerns, working capital exceeds fixed capital stock by more than half. Accountants normally use working capital to determine firms' liquidity as it is an indicator to measure the net position of firms (both real and financial) liquid assets. It is equal to the difference between current assets and current liabilities (Ding et al. 2013). Accounts receivable, inventories, and cash & cash equivalents are three main components of current assets. Further, materials, work-in-process, and finished goods are common classification of inventories. Ramey (1989) and Blinder and Maccini (1991) stated

that materials and work in process are more unpredictable than finished-goods. Accounts payable and liabilities due within one year constitute current liabilities.

Dewing (1941) elucidates the reasons why working capital is one of the major part of firm besides fixed capital. The worth of working capital, specially inventories and transaction services, in the production function is highly encouraged (Kim and Srinivasan (1988) and Ramey (1989, 1991)). Production function is directly associated with the inventory components of working capital. Firms usually hold stock of material in order to reduce the chances of stock outs and to ensure smoothening in production process. Firms also employ work-in-process inventories while producing large batch sizes in order to attain economies of scale. Sales are typically associated with trade credit and finished goods inventories, specially the later can have a great impact on customers. Lastly, liquidity of firms' cost is affected by cash & cash equivalents and current liabilities. For instance, firms get advantage in the form of discounts for prompt payments and reduced financing costs due to availability of adequate cash stocks and compensating cash balances respectively.

Dewing (1941) emphasized that the liquid nature of working capital differentiates it with fixed capital. An emphasis has been made on reversibility of working capital, contrary to materialization of new studies based on irreversibility of fixed capital (Pindyck's survey (1991)). Firm's tendency to consume raw materials inventories faster than they are replenish can lead to temporarily negativity in its working capital. Working capital can be liquidated either by implementing strict credit policies for new sales or by increasing endeavors to accumulate account receivables. Consequently, accounts receivable per dollar of sale becomes lower than normal (see Meltzer (1960). Meltzer (1960) purports that when firms with weak liquidity position confront tight money, they reduce account receivable, but firms with strong liquidity

position do not. Liquid assets are also used as collateral for short term borrowing by firms, resulting in decrease in working capital through an increase in current liabilities. Considering the importance of working capital it is also included in the investment equation.

2.4 Hypothesis

Based on theoretical and empirical evidence presented above following two hypotheses are tested in this research study:

$1H_0$: Internal cash flows have no significant impact on corporate fixed investments.

$1H_1$: Internal cash flows have a significant positive impact on corporate fixed investments.

$2H_0$: Financially constrained firms have no significant higher investment to cash flow sensitivity compared to financially unconstrained firms.

$2H_1$: Financially constrained firms have significant higher investment to cash flow sensitivity compared to financially unconstrained firms.

Chapter III

Research Methodology

This chapter is devoted to description of research methodology used to study the topic under consideration. First, the research sample and data sources are illustrated. Second, the empirical methodology used for the analysis and hypothesis testing is described. Third, an explanation of main and control variables used for study are discussed. In the end, empirical model is defined.

3.1 Research sample

In this thesis a sample of non-financial firms from Pakistan is analyzed. The non-financial corporate sector is one of the main segments of any economy and for economic well being a sound, robust and stable industrial base is indispensable. In Pakistan non-financial businesses represents a diversified nature of businesses including textile, chemicals, pharmaceuticals, food, motor vehicles and parts, mineral products, fuel & energy, petroleum products, communication and transport services, electrical equipments, paper products and other services. Compared with Cleary et al. (2007) and Guariglia (2008), the firms in this data sample operate in more broad range of industrial sectors.

The secondary research strategy is used and data is collected from publications of the state bank of Pakistan (SBP), annual reports of the companies and business recorder database. SBP reports also construed data from annual reports published by organizations. In literature Secondary data is substantially used for studying investment cash flow sensitivities, such as Fazzari et al. (1988), Kaplan & Zingales (1997), Konings et al., 2003; Bakucs et al., 2009; D'Espallier & Guariglia, 2012). In the developing and transition economies the firm level data

often contains accounting deficiencies (Poncet et al, 2010). Similarly the Pakistani corporate data also contained outliers and missing values that may result in biased estimates. The number of reporting companies varied from year to year. As far as data cleaning is concerned, only the firms that have reported data for all the variables over the complete sample period are included in analysis i.e. a balanced panel data is used (Ding et al. 2013). The sample period contains 10 years from 2002 to 2012. The final selected sample comprised of 2880 firm-years from 288 companies. All corporations included in sample are listed on Karachi Stock Exchange (KSE) and public limited companies.

As conferred, data with outliers may result in biased outcomes. Cleary (1999), Aggarwal and Zong (2006), George et al. (2011) and Ding et al. (2013) applied certain principles to control for such influence of outliers. These rules exist of trimming or winsorizing data below and above minimum and maximum values. These techniques are used to avoid biasness in results and it is a standard procedure used excessively in literature (Bond et al. (2003), Bhagat, Moyen & Suh (2005), Cummings et al. (2006), Guariglia, (2008) and D'Espallier & Guariglia, (2012)). To control for potential influence of outliers and to increase the comparability with literature this research also winsorizes in 1% tails of all regression variables. This routine is identical with Lyandres (2007), Denis & Sibilkov (2010), D'Espallier & Guariglia, (2012), Firth et al. (2012) and cheng et al. (2014).

3.2 Econometric methodology

Primarily, regression analysis is used in this study to determine the nature of relationship connecting investment, financial constraints and internal finance. However there is no consensus between researchers on the ones best model for studying the firm investment and financing behavior. According to Koop (2005) linear regression is one of the best techniques to study such

relationships that provide insights, how dependent variable is influenced by explanatory variables. T-test is used to check for the significance level of the variables. Normal distribution of data and same variance are the assumptions of the t-test but these assumptions can be easily ignored (Hays, 1994).

For estimation panel data methodology is used in this study. Such a methodology is beneficial in controlling for problems like unobservable heterogeneity and potential endogeneity of variables. If present such problems can cause biasness in estimated results. Recent literature for example Guariglia (2008), Carpenter and Guariglia (2008) and Almeida et al. (2010) pointed out the significance of accounting and controlling for these problems. First as investment and cash flow sensitivity is being studied across organizations from different sectors so individual unobservable heterogeneity should be accounted for. Chi (2005) argued that each firm has some time invariant attributes that are not observable for researchers and one must account for such traits and components. Such characteristics may include corporate culture, strategies etc. Second the variables in the investment-cash flow regression are endogenous financial variables (Hsiao, 1986; Bond et al., 2003 and D'Espallier & Guariglia, 2012).

In order to take these problems into account, instrumental variable (IV) technique needs to be implemented. However, ordinary least square (OLS) and generalized method of moments (GMM) has been used in previous studies (Guariglia (2008), Ağca & Mozumdar (2008), Hadlock & Pierce (2010), George et al. (2011) and Firth et al. (2012)). In this study GMM is implied because OLS is consistent only when variables under investigation are exogenous (De Veaux, Velleman, & Bock, 2008). Erickson & Whited (2000), Bond et al. (2003) and D'Espallier & Guariglia (2012) argued that variables in the investment equations have endogenous behavior and OLS estimation results in biased and inconsistent outcomes (Hsiao, 1986). Ogaki (1993)

argued that GMM estimator is best in such a condition as it ingrains all other IV methods as specialized cases. Hence GMM, an instrumental variable procedure is used to prevent and control for the possible endogeneity among variables.

Following Carpenter and Guariglia (2008) and Guariglia (2008), differenced GMM estimator proposed by Arellano and Bond (1991), is used in this study. It controls for both the individual heterogeneity and endogeneity problems. Carpenter and Guariglia (2008) argued that differenced GMM is also more efficient then within group IV estimator and OLS because of Nickel (1981) bias. In differenced GMM first differencing process is made upon equation to eliminate the unobserved effects.

Appropriate adoption of instruments is necessary for the model success to produce consistent, unbiased and efficient estimates. Two tests have been used in this study for identification and validation of instruments. The models validity is indicated by the null hypothesis of these tests. Therefore, the instruments are valid at least at 10% of significance level i.e. the nulls fail to be rejected. However, lag values of variables are used as instruments.

Blundell et al. (2000) argued that Sargan test (also known as J test) is a test of over-identifying restrictions and can be used for testing validity of orthogonality conditions in the GMM. Baum et al. (2002) suggest that Sargan test works as a double edge sword to test for instruments validity and moment conditions. The model is correctly specified and the instruments are valid if these conditions hold. J-stat is distributed as $\chi 2$ (chi-square) under the null of instrument validity. The null hypothesis is stated as; “extra” instruments are uncorrelated with the error term. The degree of freedom is given as number of instruments less number of parameters.

The second test used is Arellano and Bond (1991) serial correlation statistics for first and second order correlation in differenced residuals. The tests output gives two separate statistics for both correlations. The statistic for first order is expected to be significant and insignificant for second order correlation for the residuals to be uncorrelated in level forms and if innovations are i.i.d. Baltagi (2005) argues that this test is crucial because it identifies the consistency of the GMM estimators.

3.3 Variables

In this section variables are defined. The conceptual model contains three types of variables. Investment is a dependent variable; internal finance is an explanatory variable while a financial constraint is a moderating variable. Moreover, to eliminate and control for idiosyncrasy and eccentricity extra control variables are also employed.

3.3.1 Investment

Keynes (2006) defined investment as total tangible fixed capital. In this particular line of research, most researchers focused on change in tangible fixed capital (Fazzari et al., 1988; Kaplan & Zingales, 1997; Audretsch & Elston, 2002; Rauh, 2006; Degryse & De Jong, 2006; Guariglia, 2008; Bassetto & Kalatzis, 2011; D'Espallier & Guariglia, 2012; Firth et al., 2012 and Ding et al. 2013). So in alignment with literature investment is defined as the difference between the end and the beginning of a year tangible fixed assets plus depreciation of current year.

3.3.2 Internal finance

Fazzari et al. (1988) argued that internally developed reserves are beneficial because of presence of premium and wedge between internal and external finance. Jordan et al. (2011)

defined internal finance as a part of corporate income that is held back in the organization. Thus retained earnings or depreciation are the best examples of internal finance.

Following Fazzari et al. (1988), Fazari & Peterson (1993), Kaplan & Zingales (1997), Ağca & Mozumdar (2008), Guariglia (2008) and Ding et al. (2013) internal finance is measured by operating cash flows calculated as net income before extraordinary items plus depreciation. This operationalization of cash flow is in compliance with the definition of internal finance.

3.3.3 Financial constraints

In this research degree of financial constraints is measured through empirical modus operandi. To increase the validity and robustness, study uses two different types of five distinct measures. Two one variable (single) proxies namely size and age of the firms and three indices namely, SA-index proposed by Hadlock & Pierce (2010), KZ-index proposed by Kaplan & Zingle (1997) and Z-Score of Altman (1968) are used. Quite a lot of researchers used single proxy variables for measuring financial constraints (Carpenter, Fazzari, & Petersen, 1994; Almeida et al., 2004; Rauh, 2006; Faulkender & Wang, 2006; Denis & Sibilkov, 2010 and Baños-Caballero et al., 2014). Single variable proxy can be a good measure if it is highly correlated with financial constraints. Cleary et al. (2007) argued that it is hard to find a good variable because of weak correlation problem. Subsequently, three indices are also implied in this study.

Hadlock & Pierce (2010) argued that exogenous firm features should be used in measuring financial constraints. They created SA-index based on most comparative exogenous firm specific characters, size and age of the firm for measuring financial constraints. High index score corresponds to unconstrained while low score corresponds to constrained firms. The size of

the firm can be measured as natural logarithm of total assets or sale while the age is defined as listed age (number of years a corporation is listed on exchange) by Hadlock & Pierce (2010). Both sales and assets are used for size and SA-indices are calculated as:

$$SA_1 = -0.737(Sales) + 0.043\,(Sales)^2 - 0.040(Listed\ Age) \quad \ldots\ldots\ldots \quad (1)$$

$$SA_2 = -0.737(Total\ Assets) + 0.043(Total\ Assets)^2 - 0.040(Listed\ Age) \ldots\ldots\ldots (2)$$

Second measure, the KZ-index consists of five variables. Kaplan & Zingle (1997) perform a logit regression on pre classified firms. In ailment with previous studies same regression coefficients are used in calculation (Lamont et al. 2001 & Cheng et al. 2014). Contrary to SA-Index, the financially constrained firms have higher KZ-Index values and vice versa. KZ-index is calculated from following equation (3):

$$KZ = -1.001909 \times R_1 + 0.2826389 \times R_2 + 3.139193 \times R_3 - 39.3678 \times R_4 - 1.314759 \times R_5$$

Where, R stands for ratio, R_1 is cash flows/fixed capital stock, R_2 is Tobin Q calculated as book value of assets minus book value of equity plus market value of equity divided by book value of assets, R_3 is total debt/total capital, R_4 is dividends / fixed capital stock and R_5 is cash stock/ fixed capital stock. These indices are used by Lamont et al. (2001), Baker et al. (2003), Almeida et al. (2004), Malmendier & Tate (2005), Bakke and Whited (2010), Hong et al. (2012) and Cheng et al. (2014).

Last measure of financial distress is the Z-score proposed by Altman (1968). This measure of capital constraints is also used in a large body of literature (Cleary, 1999; Aggarwal & Zong, 2006; Becchetti et al., 2008; Baños-Caballero et al., 2014). The firms with high Z-

Scores are classified as unconstrained while the firms with low scores are classified as constrained. Formula used for Z score is:

$$Z = 1.2R_6 + 1.4R_7 + 3.3R_8 + 0.6R_9 + 0.99R_{10} \ \ldots\ldots\ldots \ (4)$$

Where, R_6 is working capital/total assets, R_7 is retained earnings/total assets, R_8 is earnings before interest and taxes/total assets, R_9 is market capitalization/book value of total liabilities and R_{10} is net sales/total assets.

These indices are used to categorize firms into financial constraint and unconstraint groups on the basis of median values. Businesses with above median scores in case of SA-index and Z-score are classified as unconstrained and constrained under KZ-index and mutatis mutandis.

3.3.4 Control variables

To study investment and internal finance relationship control variables are introduced in the model. These variables also regulate and control for firm distinctive factors (De Veaux et al., 2008). It is critical and crucial to contain control variables to augment result robustness and to monopolize biasness. In line with former researches following control variables have been used.

3.3.4.1 Investment opportunities

The most important control variable used in the literature is the investment opportunities. There is no consensus on one proxy for measuring investment opportunities. In alignment with Fazzari et al. (1988), Smith & Watts (1992), Fazari & Peterson (1993), Kaplan & Zingales (1997), Opler et al. (1999), Fenn & Liang (2001), Almeida et al., 2004 and Xu (2013) Tobin Q is used as a proxy for investment opportunities. Average Q is used to proxy for the unobservable Tobin's Q (Audretsch & Elston, 2002). It is calculated as book value of assets minus book value of

equity plus market value of equity divided by book value of assets (Attig et al., 2012 and Francis et al., 2013). A positive sign of coefficient for growth opportunities is expected in investment cash flow sensitivities regression Fazzari et al (1988).

3.3.4.2 Output

Net sales are used as an authentic proxy for productivity or output (Blundell et al., 1992; Audretsch & Elston, 2002; Aivazian et al., 2005b). The corporation's sale also acts as a proxy for changes in product demand in investment-cash flow regression (Xu, 2013). Therefore, sales are included as a control variable and positive relationship is expected (Ndikumana, 1999).

3.3.4.3 Leverage

Based on the pecking order theory, Chiou et al. (2006) suggested that to reduce issue costs and limitations and monitoring by the shareholders businesses try to use internal finance for financing long term fixed investments. Leverage is measured as ratio of total debt to total assets at time t. Therefore, a company with more debt to assets ratio means that it has less internal financing opportunities. Notwithstanding, a negative relationship of leverage is expected with investment and can be explained as a means that increases inducement for investment in low profile ventures (Lang et al., 1996; Aivazian et al., 2005a, 2005b; and Pindado et al. 2011).

3.3.4.4 Working Capital Investment

Fazzari and Petersen (1993) pointed out that investment in working capital is more susceptible to pecuniary restraints than fixed capital investment. Consequently, optimal working capital level for a financially constrained firm is understood to be lower because it needs financing to keep a positive healthy working capital balance. Similarly, Hill, Kelly, and Highfield (2010) showed that firms with higher capital market access and higher internal financing capabilities have higher working capital balances. Working capital investment is also

included in the regression because a firm's net working capital can be a substitute for cash (Almeida et al., 2004). A negative sign is expected of working capital investment because it may act as a substitute to fixed investment for limited resources of funds and working capital investment is measured as change in working capital stock from period t to t-1 while working capital stock is current assets less current liabilities at time t (Fazzari and Petersen, 1993; Almeida et al., 2004; Ding et al., 2013 and Baños-Caballero, 2014).

3.3.4.5 Change in Long Term Debt

Fazzari and Peterson (1993) argued that net change in outstanding long-term debt can be treated in a parallel to changes in investment in working capital. Hence, in the fixed-investment regression changes in long term debt is treated as an endogenous source-of-funds variable. Deveureux and Schiantarelli (1990) also noticed few similarities in internal and external sources of financing. In addition, Almeida et al (2004) argued that firm's debt capacity can also be a substitute for cash. In calibration with Whited (1992), Fazzari and Peterson (1993), Brown & Peterson (2009) and Xu (2013) a positive sign is expected of change in long term debt in the regression. Change in long term debt is measured as difference between long term debt of period t and t-1 (Fazzari and Petersen, 1993).

3.4 Empirical research model

Empirical research model for investment based on Q theory stemmed from specification of Fazzari et al. (1988), where Tobin q and cash flow were the two core explanatory variables. In this study there model is extended by including additional control variables as explained above. Particularly, following baseline empirical specification is used for testing hypothesis:

$$\frac{I_{it}}{K_{i,t-1}} = \alpha + \beta \frac{CF_{it}}{K_{i,t-1}} + \gamma Q_{it} + \delta \frac{S_{it}}{K_{i,t-1}} + \vartheta \frac{DLTD_{it}}{K_{i,t-1}} + \rho LEV_{it} + \varphi \frac{WKI_{it}}{K_{i,t-1}} + \varepsilon_{it} \qquad (5)$$

Whereas, I represents investment calculated as difference between tangible fixed assets at period t and t-1 plus depreciation at time t, K represents fixed capital stock calculated as book value of tangible fixed assets at time t, CF represents cash flows (internal finance) measured as net income before extraordinary items plus depreciation at time t, Q represents Tobin q measured as book value of assets minus book value of equity plus market value of equity divided by book value of assets at time t, S represents sales measured as total net sales at time t , DLTD represents change in long term debt measured as difference between long term debt of periods t and t-1, LEV represents leverage measured as ratio of total debt to total assets at time t and WKI represents working capital investment measured as change in working capital stock from period t to t-1while working capital stock is current assets less current liabilities at time t. The subscript i and t denotes i-th organization and t-th period respectively.

To control for possible firm level heteroscedasticity a large flock of literate on investment (Fazzari et al., 1988 & 2000; Kaplan & Zingales, 1997 & 2000 and Rauh, 2006) scale the variables because of differences in firm sizes. For eliminating such differences and effects of size, the variables are scaled by the capital stock level. Distinctively, a considerable fraction of studies also used the beginning of the year tangible fixed assets for scaling variables. Following Degryse & De Jong (2006), Silva & Carreira (2010), Firth et al. (2012), D'Espallier & Guariglia (2012) and Ding et al. (2013) this study also scaled variables by beginning of the year balances of tangible fixed assets to control for heteroscedasticity.

Two hypotheses are devised to answer the research question. In this empirical model, investment to cash flows sensitivity is reflected by the coefficient β. A positively significant cash flows coefficient will accept the hypothesis 1. For testing hypothesis 2, firms are classified on

the basis of financial constraints status. Hypothesis 2 is accepted if financially distressed firms carry significantly larger positive cash flow coefficient than unconstrained firms.

Chapter IV

Results

Empirical results of the study have been discussed in this chapter. First based on hypothesis descriptive statistics of the variables are examined. Second, correlation analysis is performed to test for any relationship between variables under study. Finally, a regression model is used to test for hypothesis and analyze the nature of relationship between investment and internal finance under financial constraints.

4.1 Descriptive Statistics

There are several important aspects notable from descriptive statistics. The median value of investments (I/K) is 0.1119 that is comparable to preceding studies. Fazzari & Petersen (1993) reports a median variable of 16.1%, Degryse & De Jong (2006) also studied firms in the Netherlands and they report a median variable of 16.1%, Cleary et al. (2007) found 21% for all their balanced observations and Chen & Chen (2012) reports a median investment variable between 15% and 23%. The mean value of variable is 0.2907 alongside Cleary (2006) reports a mean variable of 44% for the sub sample of France, Bechetti et al. (2009) showed a mean variable between 66% and 507%, Bassetto & Kalatzis (2011) reports for a sample with Brazilian firms a variable of 44.2% and D'Espallier & Guargilia (2012) showed a mean variable of 18.07% for a sample with Belgian SMEs. The investment ratio has a standard deviation of 0.5583. The operating cash flow ratio, the main explanatory variable, has an average of 0.3398, a median of 0.1533 and a standard deviation of 0.7174. This highlights the considerable difference in investment and operating cash flow among the sample companies.

The average proportion of debt in relation to total assets is 0.6525, whereas the average change in long term debt is 0.0654, which indicates an increasing trend for company debt. The average of Tobin q is 1.1122, sales ratio is 5.550759 and working capital investment ratio is 0.076749. The sales ratio shows a large range, the maximum value is approximately seven standard deviations away from mean. The difference between the descriptive statistics of size measured by the book value of total assets and total sales are negligible, especially when the use of these variables is considered. The natural logarithm is used, and hence, the differences between the two variables are decreasing.

Table:1

Variables	Minimum	Q1	Median	Q2	Maximum	Mean	Std. Dev.
I/K	-0.35015	0.028336	0.111866	0.308728	3.685651	0.290727	0.558387
CF/K	-0.71555	0.045719	0.15327	0.364877	4.675454	0.339816	0.717437
Q	0.3238	0.762492	0.917757	1.200067	5.39007	1.112205	0.73382
LEV	0.098815	0.475302	0.642751	0.764045	2.381815	0.652476	0.327431
DLTD/K	-0.53933	-0.04569	0	0.099715	1.334895	0.065413	0.272102
S/K	0.120924	1.414933	2.558969	4.934081	76.25794	5.550759	10.45301
WKI/K	-2.08518	-0.10594	0.016671	0.166196	3.132194	0.076749	0.58189
Ln(Sales)	0.741937	6.622527	7.569821	8.564595	13.83964	7.601785	1.675142
Ln(Assets)	1.629241	6.572889	7.489529	8.610589	12.75831	7.619384	1.537159

4.2 Correlation Analysis

Correlation between variables along with significance levels is reported in table 2. The highest significant correlation is noted between investment and cash flows or change in long term debt i.e. internal and external financing sources respectively. The correlation coefficient is 0.2923 for cash flows and 0.2986 for change in long term debt. The significant positive association between internal and external finance and investments is also evident from literature like Guariglia (2008), Brown & Peterson (2009), Silva & Carreira (2010), Wan & Zu (2011), Firth et al. (2012) and Xu (2013). This positive association also provides base for the hypothesis 1 of the study for this sample. However it does not provide the determination of relationship.

Further, as expected the correlation of investment with leverage and working capital investment is negative while with growth opportunities (Tobin q) and output (sales ratio) is positive.

Table:2
Correlation Analysis
Sample: 2004 2012
Included observations: 2592

Correlation Probability	I/K	CFN/K	DLTD/K	LEV	Q	S/K	WKI/K
I/K	1.0						
CF/K	0.2923*	1.0					
DLTD/K	0.2986*	0.0081	1.0				
LEV	-0.0098	-0.1703*	0.0526*	1.0			
Q	0.0041	0.2366*	0.0069	0.1828*	1.0		
S/K	0.2093*	0.5414*	0.0101	-0.0748*	0.2595*	1.0	
WKI/K	-0.0637*	0.5248*	0.1727*	-0.1130*	0.0784*	0.3109*	1.0

Significance level: * 1%, **5% & ***10%

4.3 Regression Results

Regression analysis is used for testing hypothesis and studying the nature of relationship and causality between fixed investment and internal finance. First overall sample is studied to test for investment-cash flow sensitivities then sample is divided on the basis of predetermined criterion for financial constraints. To check for robustness a number of different criterions have been applied for grouping firms in financially constrained and unconstrained firms.

De Veaux et al. (2008) argued that for multiple liner regression the population error term should be normally distributed. But this assumption can be easily ignored if sample size is greater than 30 (Hays, 1994). In this study, Skewness, kurtosis and histogram are also implied to

check for normality. They showed data does not meet near normal conditions. However, De Veaux et al. (2008, p. 446) suggested that this condition matter only in case of small size samples and as the sample size increases the mean of sampling distribution becomes more normal.

4.3.1 Full Sample

The full sample regression results are shown in table 3 under column 'Full Sample'.

Table:3

Panel: A					
Variable	**Full Sample**	**Firm Size**		**Firm Age**	
		Large	**Small**	**Old**	**Young**
CF/K	0.392*	0.283*	0.761*	0.423*	0.531*
Q	1.811**	0.124	0.670***	1.394	-0.463
DLTD/K	0.849*	0.507*	0.822*	0.854*	0.510*
LEV	-6.189*	-0.874**	-1.674*	-6.886	-0.295
S/K	0.036*	0.062*	0.009	0.033*	0.005
WKI/K	-0.615**	-0.127**	-0.854*	-0.613*	-0.526*
Panel: B					
Sargan Test					
J-statistic	1.2326	4.3248	6.5257	6.1561	0.8445
Prob(J-statistic)	0.8727	0.3638	0.1632	0.1043	0.8388
Arellano-Bond Serial Correlation Test					
m1	0.0016	0.0000	0.0001	0.0642	0.0000
m2	0.1405	0.1002	0.1376	0.2927	0.3495
Panel: C					
Adjusted Periods	6	6	6	6	6
Firms	288	184	152	183	156
Firm-years	1728	952	776	898	761

Significance level: * 1%, **5% & ***10%

The estimated results in Panel A of table 3 showed that on average Pakistani non-financial firms increase 0.392 units of their investment for each extra unit of cash flows. This indicates a positively significant relationship between investment and internal finance at 1% level of significance. Therefore, these results support hypothesis 1. The results are in alignment with Fazzari et al. (1988) for US firms, Kaplan & Zingles (1997) for US firms, Lensink et al.

(2003) for Indian firms, Carpenter & Guariglia (2008) for UK firms, John Wei & Zhang (2008) for eight East Asian markets, Wan & Zhu (2011) for china firms and Etemadi & Baghiyan (2013) for Iran firms.

Tobin q is also positively significant at 5% with coefficient of 1.811 (Francis et al., 2013 and George, Kabir, & Qian, 2011). A positively significant relationship between change in long term debt (DLTD/K) and investment also exist (Fazzari & Petersen, 1993 and Brown & Petersen, 2009). Leverage (LEV) is negatively significant (Lang et al., 1996 and Pindado et al. 2011), Sales ratio (S/K) is positively significant (Blundell et al. 1992 and Audretscha & Elston, 2002) and Working capital investment (WKI/K) is negatively significant with -0.615 coefficients (Fazzari & Petersen, 1993 and Ding et al. 2013).

J Statistic and Arellano-Bond Serial correlation test are displayed in panel B of the table 3. J statistics is insignificant. The null hypothesis that the "extra" instruments are uncorrelated with the error term is not rejected. Thus model and instruments are valid (Sargan, 1958, 1975 & 1988; Hansen, 1982; and Bhargava, 1991). The Arellano-Bond Serial correlation test also evidenced significant first order correlation (m1) and insignificant second order correlation (m2) in differenced form. That shows no autocorrelation in levels form of error terms. Hence the model is valid and there is no problem of auto correlation in the model (Arellano & Bond, 1991 and Doornik, Bond & Arellano, 2006). Panel C of table 3 represents the total sample size included in regression of 288 firms, with 6 adjusted periods and total 1728 firm-years.

The main aim of this thesis is to study the differences of investment sensitivities to cash flows across different groups of firms based on financial constraints. Five different criterions have been used as a base to slice the full firm sample in to two mutually exclusive groups of

constrained and unconstrained firms based on medians values (Baños-Caballero et al., 2014). The following results are reported based on those criterions:

4.3.2 Size and Age

The First two criterions used for classification of firms are size and age. The firms are divided on the basis of median value of total assets and firm age. If the age or size is less than median value firm is sorted as small and young otherwise large and old based on size and age respectively. In this study younger and small size firms are considered constrained because of information asymmetry problem and vice versa.

Regression results are presented in the Panel A of table 3.The results show that all the four sub samples bear positively significant investment-cash flow sensitivities. The large size firms confirmed a positive coefficient of 0.283 which is significantly smaller then small size firms with coefficient of 0.761 at 1% level of significance. On the other hand, younger firms bear a positive coefficient of 0.531 which is significantly greater than older firm's coefficient of 0.423. These results are in consonance with Fazzari et al (1988), Audretscha & Elston (2002), Biddle and Hilary (2006), Agca & Mozumdar (2008), Ascioglu, Hegde & McDermott (2008) and Ding, Guariglia & Knight (2013) and contrary to Kaplan & Zingles (1997), Cleary (1999), Gomes (2001), Alti (2003), Cleary (2006), Cleary et al. (2007) Lyandres (2007) and Hovakimian (2009), and Chen and Chen (2012).

Azam & Shah (2011) also studied the relationship between size and age with investment in 52 listed companies of Pakistan. They showed positive coefficient for size and negative coefficient for age. Results of this study also compliment their findings. All the coefficients are significant and carry expected signs except Tobin q and sales. Fazzari et al. (1988, p167-169)

also showed negative signs for Q and argued that it can be due to mismeasurement error or Q may not be representing market fundamentals. Another study by Islam (2006) studied Bangladesh and finds insignificant coefficient for Tobin q and Sales and argued that financial markets in Bangladesh are less developed and may induce un-even market competition. Coefficient of large firms (0.507) for DLTD/K is significantly less than small firm's coefficient (0.822) while for LEV is significantly greater then large firms (Ndikumana, 1999 and de Almeida & Eid, 2014). It can be because small firms are additionally debt oriented and use debt to a greater extent compared to equity for fixed investment (Kurshev & Strebulaev, 2007). Large unconstrained firm's investments are less sensitive to WKI/K as compared to constrained small firms (Fazzari & Petersen, 1993) because large firms have easy access to financial markets and face less information asymmetry as compared to small constrained firms (Leary & Roberts, 2005).

Panel B of table 3 shows the Sargan test and Arellano-Bond serial correlation test for validity of the model. Insignificant J statistics express non rejection of null hypothesis and adding to validity and reliability of model and instruments (Sargan, 1958 &1975; Hansen, 1982; Sargan 1988; and Bhargava, 1991). Negatively significant m1 and insignificant m2 in differenced form evidenced resolution of autocorrelation problem in levels form. Therefore the model is valid and there is no problem of auto correlation in the model (Arellano & Bond, 1991 and Doornik, Bond & Arellano, 2006). While Panel C of table 3 is showing 6 adjusted periods included in each regression sample. In addition, 184 firms are included in large size sample with 952 observations, 152 firms in small size sample with 776 observations, 183 firms in old aged firms sample with 898 observations and 156 in less aged firms sample with 761observations.

4.3.3 SA-Index

The third criterion used is SA-Index of Hadlock & Pierce (2010). The results based on this criterion are shown in table 4 below:

Table:4

Panel: A				
	SA-Index 1		**SA Index 2**	
Variable	**Unconstrained**	**Constrained**	**Unconstrained**	**Constrained**
CF/K	0.447*	1.124*	0.377*	0.796**
Q	0.079	1.780**	1.031**	1.532***
DLTD/K	0.365**	0.781*	0.475*	0.414**
LEV	-0.818**	-2.993*	-1.731*	-1.824**
S/K	0.062	0.003	0.029*	0.021
WKI/K	-0.363*	-0.890*	-0.347*	-0.654*
Panel: B				
Sargan Test				
J-statistic	1.2179	2.6451	3.1141	5.6236
Prob(J-statistic)	0.5439	0.4496	0.2108	0.1314
Arellano-Bond Serial Correlation Test				
m1	0.0000	0.0013	0.0001	0.0001
m2	0.1494	0.1091	0.1356	0.1397
Panel: C				
Adjusted Periods	6	6	6	6
Firms	172	207	165	208
Firm-years	766	962	764	964

Significance level: * 1%, **5% & ***10%

The firms are categorized as constrained and unconstrained based on SA indices. If the SA-Index is below the median value then firm is categorized as constrained and mutatis mutandis. As explained before, SA-Index 1 used total assets while SA-Index 2 implied sales as a proxy for size in calculation of index values. The regression results are shown in panel A of table 4 while Sargan test and Arellano-Bond Serial correlation test stats are presented in panel B.

Under SA-Index 1 the constrained firms have investment-cash flow sensitivity of 1.124 which is approximately 2.5 times greater than unconstrained firms (0.447) at a significance level

of 1 %. On the other hand SA-Index 2 also showed more or less similar results. Constrained firms have a positively significant coefficient of .796 which is greeter then .377 coefficients of unconstrained firms. These results are comparable to Fazzari et al. (1988, 2000), Fazzari & Peterson (1993), Almeida and Campello (2007), Guariglia (2008), Carpenter & Guariglia (2008), Kalatzis & Azzoni (2009) and Cheng et al. (2014) and counter to Kaplan & Zingles (1997), Cleary (1999), Gomes (2001), Alti (2003), Cleary (2006), Cleary et al. (2007) Lyandres (2007) and Hovakimian (2009), and Chen and Chen (2012).

All variables carry expected signs but analogous to size and age benchmarks, Tobin q and sales are insignificant (Fazzari et al., 1988 and Islam, 2006). Under both index constrained firms show greater coefficients for Q (Carpenter & Guariglia, 2008). It can be explained under agency theory. Large unconstrained firms have excessive resources to invest so managers may invest in less profitable and negative present value projects while investments of small firms are coerce by low funds availability to depend on investment opportunities. DLTD/K show significant values as 0.365, 0.475 and 0.781, 0.414 and LEV as -0.818, -1.731 and -2.993, -1.824 for unconstrained and constrained firms. These results are in line with Lang et al., (1996) and Ascioglu et al. (2008). Again large unconstrained firm's investments are less sensitive to WKI/K as compared to constrained small firms (Fazzari & Petersen, 1993, Leary & Roberts, 2005).

Sargan test statistic is insignificant for all the four samples. J stat 1.2179 and 3.1141 for unconstrained firms and 2.6451 and 5.6236 for constrained firms with probabilities of 0.5439, 0.2108, 0.4496 and 0.1314 respectively. Thus represents the validity of model (Sargan, 1958 &1975; Hansen, 1982; Sargan 1988; and Bhargava, 1991). Arellano-Bond serial correlation test also shows the validity of all results i.e. significant negative m1 serial correlation and insignificant m2 serial correlation (Arellano & Bond, 1991 and Doornik, Bond & Arellano,

2006). While Panel C showed that 6 adjusted periods are included in regression with 172, 207, 165 and 208 firms and 766, 962, 764 and 964 firm-years respectively in each regression.

4.3.4 KZ-Index and Z-Score

The fourth and fifth criterions are the KZ-Index and Altman Z-Score respectively. Results based on these criterions are given in table 5:

Table:5

Panel: A				
	KZ-Index		**Z-Score**	
Variable	**Constrained**	**Unconstrained**	**Unconstrained**	**Constrained**
CF/K	0.461*	0.404*	0.252*	0.361*
Q	1.266**	0.580***	0.984*	0.507***
DLTD/K	0.830*	0.332***	0.623*	0.701*
LEV	-2.441*	-2.539**	-1.565*	-4.881*
S/K	0.032*	0.036*	0.038*	0.050*
WKI/K	-0.815*	-0.188*	-0.325*	-0.582*
Panel: B				
Sargan Test				
J-statistic	4.3381	1.0231	0.9988	2.4250
Prob(J-statistic)	0.2272	0.7957	0.8015	0.6581
Arellano-Bond Serial Correlation Test				
m1	0.0000	0.0000	0.0000	0.0098
m2	0.4024	0.2238	0.2085	0.8071
Panel: C				
Adjusted Periods	6	6	6	6
Firms	217	211	227	220
Firm-years	881	847	863	863

Significance level: * 1%, **5% & ***10%

The firms are classified based on KZ Index and Z-Score. Based on KZ-Index a firm is classified as constrained if index output of that firm is above median and classified as unconstrained if index score is below median value. Contrarily, in case of Z-Score, the firms are categorized as constrained if the firms score is below the median and unconstrained if its score value is above the median value.

The regression results are shown in panel A of table 5. All the predicting variables are significant and carry expected signs. The constrained firms showed 0.461 and 0.361, greater investment sensitivities to cash flows compared to unconstrained firms 0.404 and 0.252 grouped under KZ-Index and Z-Score respectively. The results are in conformity with Fazzari et al. (1988, 2000), Whited (1992), Ndikumana (1999), Javorcik & Spatareanu (2009), Beatty, Liao and Weber (2010), Hirth & Viswanatha (2011) and Baños-Caballero (2014) and in conflict with Kaplan & Zingles (1997), Cleary (1999), Gomes (2001), Alti (2003), Cleary (2006), Cleary et al. (2007) Lyandres (2007) and Hovakimian (2009), and Chen and Chen (2012).

Again under these criteria's, constrained firms show greater coefficients for Q and It can be explained under capital market imperfections (Agca & Mozumdar, 2008; Ascioglu et al., 2008 & Carpenter & Guariglia, 2008). Managers of large unconstrained firms may invest in less profitable projects because of agency problem. Change in long term debt has positively significant larger coefficient for constrained firms under both KZ index and Z-Score. It is in alignment with Ndikumana (1999), Ascioglu et al. (2008) and de Almeida & Eid (2014). Leverage carries negative sign as expected (Lang et al., 1996 and Pindado et al. 2011). Moreover constrained firm investments are more sensitive to investment in working capital (Fazzari & Petersen, 1993 and Ding et al. 2013). Leary & Roberts (2005) argued that it can be due to large firms have easy access to capital markets and information asymmetry is less severe.

Sargan test and Arellano-Bond Serial correlation test is presented in panel B of table 5. The insignificant J-test, negatively significant m1 and insignificant m2 also proclaim the validity of model, instruments and results (Sargan, 1958 &1975; Hansen, 1982; Sargan 1988; Arellano & Bond, 1991; Bhargava, 1991 and Doornik, Bond & Arellano, 2006). While The Panel C of table 5 represent 6 adjusted periods included in all the regression with 217 firms with 881 firm-years

in first regression, 211 firms with 847 firm-years in second regression, 227 firms with 863 firm-years in third regression and 220 firms with 863 firm-years in last regression model.

4.4 Result Robustness

In this research study several different measures of financial constraints have been used to increase the robustness of the results. Single variable measures like age and size along with indices are used to augment the strength of study results. All the financial constraints measure showed the same results and hardly diverged from main construction of theory. The study implied a broad range of earlier as well as new developed measurements of financial constraints like Z-Score (Altman, 1964), KZ-Index (Kaplan & Zingles, 1997) and SA Index (Hadlock & Pierce, 2010). Further in calculating SA Index both total assets and Sales are separately used as a proxy for firm size but the results did not muddle. Since no major differences in the results across the different measures of the financial constraints are observed so the data analysis is robust.

Chapter V

Conclusion and Discussion

In this paper, a panel of listed Pakistani firms from a wide spectrum of industrial segments is used to investigate the effect of financial constraints confronted by corporations on investment to cash flow sensitivities. Such a comprehensive data provided an inimitable opportunity to formulate financial constraints measure exhibiting a spacious level of distinctive observations. Study implied Q-model of investment of Fazzari et al. (1988) in estimation. The results show a positively significant internal finance and investment relationship. The investment to cash flow sensitivity also increases monotonically with the level of financial constraints. Dividing the full sample based on the intensity of financial constraints experienced by the companies, the study proved that financially constrained firms have much higher sensitivities then unconstrained firms. There is also a positive relationship of investment with Tobin's q. Results are robust and applicable to a wider range of industries in Pakistan. These findings are in line with Fazzari et al. (1988) and contradictory to Kaplan & Zingles (1997).

The results of thesis have imperative implications for policy design and implementation. Results showed that firms located in emerging markets like Pakistan confront superior wedge between internal and external financing. Positively significant high investment-cash flow sensitivities adjoin to this conclusion. Moreover less developed economies have few numbers of oligopolistic large firms and a huge number of small firms. Thus in less developed nations like Pakistan lack of easy accessibility to financial markets can lead to higher underinvestment costs, pauperize economic growth and social development. Results are thus important for policy considerations regarding the subsidy and subsequent financial markets development.

The current research can be continued in various angles and paths. One such way could be to inspect the development of investment-cash flow sensitivities within firms. The existing literature incorporate explorations based on comparisons across firms, pre classified based on financial constraints. Such constraints may include strenuous accessibility to financial markets, information asymmetry etc. Moreover it will be interesting to explore how corporate events like acquisitions by a multinational corporation or international cross-listings etc that reduce financial constraints may affect the investment-cash flow sensitivities. Last, future research can study different countries characterized by different level of financial development. However, it can also be extended to include small and medium enterprises of Pakistan into the sample.

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